Climate-smart agriculture investment prioritization framework

1 December 2014 – Lima, Peru

Workshop: Tools and methods for planning and decision-making for agriculture and climate change

Caitlin Corner-Dolloff

CIAT, Decision and Policy Analysis (DAPA)

c.corner-dolloff@cgiar.org

Ana Maria Loboguerrero , Andy Jarvis, Andreea Nowak, Miguel Lizarazo, Mario Fuentes, Rado Barzev, Carlos Ardila, Osana Bonilla, Deissy Martinez Baron, Jorge Maldonado, John Gomez, Jeimar Tapasco, David Abreu, Todd Rosenstock (ICRAF), Evan Girvetz

Contents

1. Climate-Smart Agriculture?
2. Challenges for scaling up CSA interventions - CCAFS
3. Prioritization Framework
    1. Process
    2. Indicators
    3. Characteristics
4. Actions in progress

Climate-smart agriculture (CSA)?

"agriculture that sustainably increases **productivity**, enhances **resilience**, **reduces/removes GHGs**, and enhances achievement of national food security and development goals" (FAO 2010).

Productivity **Adaptation** **Mitigation**

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CSA Categories and Practices

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Forestry	Crop Production System	Soil Management	Water Management
• Agroforestry • Living fences	• Intercropping • Conservation Agriculture	• Mulching • Improved fallow	• Terracing • Drip irrigation
Pest and Disease Management	**Genetic Resource Management**	**Livestock**	**Value Chains**
• Bio-pesticides • Beneficial organisms	• Higher tolerance to heat and water stress	• Zero Grazing • Silvopastoral systems	• On farm value-added products
Fish and Aquaculture	**Energy**	**Climate Risk Management**	**Policies/Institutions**
• Aquasilviculture	• Bio-digesters for biogas	• Meteorological advisories - early warning systems	• Index based insurance schemes

Challenges for scaling out CSA

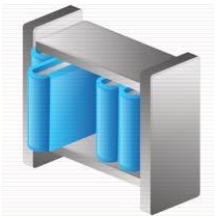
- What are ongoing CSA activities and demand for CSA?
- Can CSA investment have impact at scale?

- Lack of data about CSA practice performance

- No clear set of metrics to evaluate CSA practices
- Lack of analytical frameworks to guide selection of promising practices

CSA Country Profiles

CSA Compendium



CSA Prioritization Framework

(Guatemala, Mali, Viet Nam)

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CSA Prioritization Framework

Objectives and potential uses

- Support agriculture development and climate change planning, oriented at **achieving impact**
- Support the selection and prioritization of **investment portfolios**
- Build **technical knowledge** about CSA and CSA practices

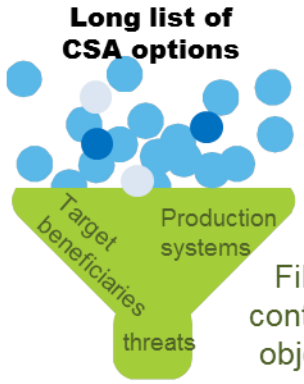
Potential users

1° Decision makers at the National level (Ministries)

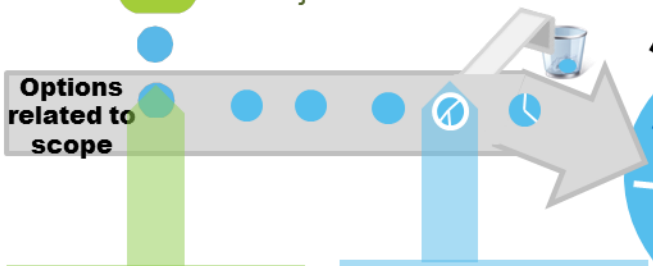
2° Producer associations, NGOs

3° Donors

CSA Prioritization Process



Filter by context and objectives

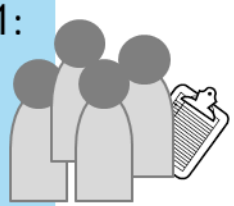


Phase 1
Assessment of Practices:

Results

Output: Ranked long list of practice

Phase 2
Workshop #1: Identification of Top Options



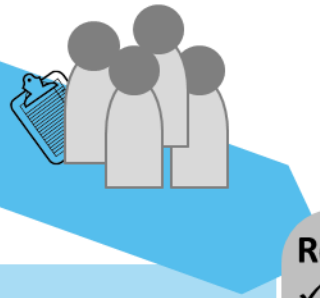
Results

Output: Short List of priority practices (5-10)

Phase 3
Calculation of Costs and Benefits of CSA Options

Results

Output:
Analysis/Valuation of top 5-10 CSA interventions. Ranked short list of practices based on CBA.



Phase 4
Workshop #2: Portfolio Development

- Visualization of trade-offs and synergies between practices

Portfolios of Prioritized CSA practices

Results

- ✓ **Portfolios identified**
- ✓ **Constraints, barriers, and strategies for adoption identified for an appropriate design of CSA Investment**

Web Portal Prototype

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The Climate Smart Agriculture Decision Support Platform was constructed to provide access to a broad database of CSA practices that have been tested around the world. This information is aimed at aiding endeavors such as identifying what CSA options exist for different contexts and gaps in research. We welcome you to search our database and contribute your own information to the compendium. Our prioritization tool we developed to identify best options for specific contexts.

Buscar

Keywords:

Region: Latin America

Country: Colombia

Source Type: Journal Articles

Farming System: - All -

Production System Type: - All -

Production System: - All -

CSA Category: - All -

CSA Practice: - All -

Search

Look for CSA practices related to the context of interest: Region, productive systems, …

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Filter 1: Search related to context

Result: List of practices relevant to context

Tools can guide selection of geographic scope and crops and threats of interest

Region	Country	Production System Type
•Sub-Saharan Africa •Middle East and North Africa •Eastern Europe and Central Asia •South Asia •East Asia and Pacific •Latin America and Caribbean	•**A** Angola Argentina etc. **B** Bahamas Barbados etc. **C** Cambodia Chile etc. **Z** etc.	•Coastal plantation & mixed •Maize-beans (Mesoamerica) •Intensive highland mixed (North Andes) •Extensive mixed (Cerrados & Llanos) •Temperate mixed (Pampas) •Dryland mixed •Etc.

Production system	CSA Category	CSA Practice	Source Type
• Beans • Fruits • Livestock • Maize • Nuts, seeds • Vegetables • Roots, tubers • Sorghum • Wheat • Etc.	• Agronomy • Agroforestry • Livestock • Postharvest • Food/Energy Systems	• Intercropping • Live fences • Silvopastoral systems • Conservation agriculture • Green manure with leguminous • Compost • Crop rotation • Etc.	•Peer reviewed article •Report •Thesis/ dissertation •Unpublished data •Working paper •Book chapter •Other

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1 List of relevant practices

2 Information about how practices perform regarding certain indicators

3 Identify missing information association with indicators

4 The database links directly with the prioritization tool

CSA Compendium Search Results

Practices	Indicators (Percentage Change)								
	YLD	VAR	LAB	INC	FAC	WUE	NUE	ERS	EMS
Silvopastoral Systems	80% ★★☆	83% ★★☆	3% ☆☆☆	20% ★★☆	42% ★★☆	90% ★★☆	68% ☆☆☆	79% ★★☆	8% ☆☆☆
Biogas	20% ★★☆	15% ☆☆☆	25% ★★☆	30% ★★☆	33% ★★☆	82% ★★☆	20% ★★☆	80% ★★★	45% ☆☆☆
Water Harvest Structure	35% ★★☆	27% ☆☆☆	85% ★★★	12% ★★☆	56% ★★★				-3% ☆☆☆
Efficient Use of Fertilizer	72% ★★☆		30% ★★☆		24% ★★☆	57% ★★☆		-40%	
Grass-Legume Association	18% ☆☆☆	32% ☆☆☆		50% ★★☆		60% ★★★	20% ★★☆	-10%	30% ★★☆
Improved Forages	10% ★★☆		3% ☆☆☆	20% ★★☆	42% ★★☆		12% ☆☆☆		10% ☆☆☆
Diseases Management	20% ★★☆	15% ☆☆☆	25% ★★☆	30% ★★☆	33% ★★☆	82% ★★☆	20% ★★☆	80% ★★★	45% ☆☆☆
Silage, Haylage and Nutritional Blocks	35% ★★☆	27% ☆☆☆	85% ★★★	12% ★★☆	56% ★★★				-3% ☆☆☆
Early Warning Systems	72% ★★☆		30% ★★☆		24% ★★☆	57% ★★☆		-40%	
Harvest Residues in Livestock Diet	18% ☆☆☆	32% ☆☆☆		50% ★★☆		60% ★★★	20% ★★☆	-10%	30% ★★☆

Indicators

YLD	Yield
VAR	Variability
LAB	Labour
INC	Income
FAC	Food access
RES	Resilience
WUE	Water use efficiency
NUE	Nutrient use efficiency
EUE	Energy use efficiency
BD	Biodiversity
PP	Pest-pathogen Resistance and Tolerance
ERS	Soil erosion
SOQ	Soil quality
EMS	Emissions intensity
OFE	On farm emissions
OFFE	Off farm emissions

Legend

The number of the starts shows the quality of the source based on the data used in the context of the experiment, along other criteria such as region, country, production system, year, etc.

★	Low
★★	Medium
★★★	High

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Practices
Silvopastoral Systems
Biogas
Structure
Forages
Diseases Management
Silage, Haylage and Nutritional Blocks
Early Warning Systems
Harvest Residues in Livestock Diet
Possible for users to add their own information
BaseLine Scenario
CSA Practice
Percentage Change
Value
Quality
Yield (YLD)
How many kilograms of food are produced for hectare each year (Kg/he/year) ?
Variability (VAR)
What is the standard deviation for yield during the production cycles of the crop (σ/kg/he) ?
Income (INC)
What is the net present value of the yearly income during the projects duration (NPV$/he/year)?
Water use efficiency (WUE)
How many liters of water are needed to produce one kilogram of the product (lt/kg/year)
Nutrient efficiency (NUE)
How many kilograms of fertilizer are needed to produce one kilogram of the product (Kg/Kg/year)
Soil erosion (ERS)
How many kilograms of soil are lost for hectare each year (Kg/he/year)?
Resilience (RES)
Does the practice allows...
Increase system diversity?
Involves some form of risk management?
Requires training and technical assistance?
Can small farmers implement this practice?
Recalculate
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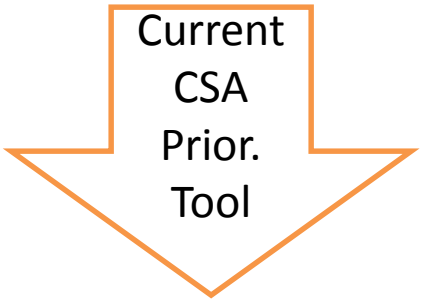

CSA Indicators

Outcomes of practice at plot/farm level

- Outcomes inherent to practice
- Limited context needed beyond plot level dynamics

Outcomes of practice at landscape level

- Assessment of aggregate effects
- Links with area on landscape relevant for different practices

Outcomes of implementation

- Outcomes less related to specific practice
- Limited assistance in deciding between practices

CSA Indicators for evaluating practices

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Pillar — Indicator — Sub Indicator — Measure

Production

Δ Yield *	Δ (kg/ha/yr)
Δ Variability *	ΔSD(kg/ha/yr)
Δ Labor *	Δ (hr/ha/yr)
Δ Income *	Δ(net $/ha/yr)

Mitigation

Δ Off farm CO2-eq emissions	(LCA CO2eq/yr)
Δ On farm CO2-eq emissions *	(g CO2eq/m2/yr)
Δ Emissions intensity *	(g CO2eq/m2/yr)

Δ C balance: soils and biomass *	Δ (g C/m2/yr)
Δ N2O emissions *	Δ (g C/m2/yr)
Δ CH4 emissions *	Δ (g CH4/m2/yr)
Δ BC emissions	Δ (g BC/m2/yr)
Δ Albedo	Δ (0-1 reflectivity coefficient and W/m2)

Δ Land use change	Δ (g CO2-eq/m2/yr)
Δ GHGs from inputs	Δ (g CO2-eq/m2/yr)

** Indicator also currently being included in CSA Compendium;*
*** Indicators currently being included in CSA compendium, but different calculation being used*

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CSA Indicators for evaluating practices

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Adaptation

Δ Food access **	Δ (kcal/person/yr)
Δ Resilience	Ordinal (e.g. 0-1)
Δ Gendered impacts *	Δ (aggregated sub-indicators)

Δ Labor by women **	Ordinal (e.g. 0-1)
Δ Adaptive capacity of women	Ordinal (e.g. 0-1)
Δ Income of women **	Ordinal (e.g. 0-1)

Δ Ecosystem services *	Δ (aggregated sub-indicators)

Δ use of irrigation water *	Δ liters/kg product/year
Δ use of fertilizer	Δ kg/kg product/year
Δ use of agrochemicals	Δ kg/kg of product/year
Δ use of non-renewable energy **	%Δ output/input ratio per kg product/year

Δ Eco-efficiency *	Δ (aggregated sub-indicators)

Δ Biodiversity	Ordinal (e.g. 0-1)
Δ Pest-pathogen **	Ordinal (e.g. 0-1)
Δ Groundwater availability	Ordinal (e.g. 0-1)
Δ Erosion *	Kg/ha/yr
Δ Soil quality **	Ordinal (e.g. 0-1)

** Indicator also currently being included in CSA Compendium;*
*** Indicators currently being included in CSA compendium, but different calculation being used*

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Indicators

Production

Indicators

- [x] Select all
- [x] Yield
- [x] Variability
- [x] Labour
- [x] Income

Add another

Adaptation

Indicators

- [x] Select all
- [x] Food access
- [x] Resilience
- [x] Water use efficiency
- [x] Nutrient efficiency
- [x] Energy use efficiency
- [x] Biodiversity
- [x] Pest-pathogen Resistance and Tolerance
- [x] Soil erosion

Add another

Mitigation

Indicators

- [x] Select all
- [x] Emissions intensity
- [x] On farm emissions
- [x] Off farm emissions

Add another

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Results

Silvopastoral Systems | Biogas | Water Harvest Structure | Efficient Use of Fertilizer | Grass-Legume Asso...

Production
Score: 12 - Mean: 3

Indicators	Value	Quality
Yield	5	★★☆
Variability	2	★☆☆
Labour	4	★★☆
Income	1	★☆☆

Adaptation
Score: 32 - Mean: 4

Indicators	Value	Quality
Food access	5	★★☆
Resilience	2	★☆☆
Water use efficiency	4	★★☆
Nutrient efficiency	3	★☆☆

Mitigation
Score: 11 - Mean: 3.6

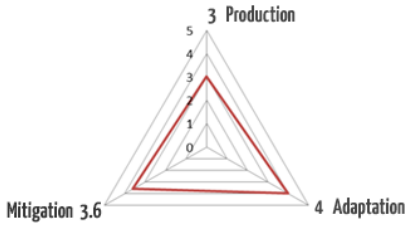
Indicators	Value	Quality
Emissions intensity	5	★★☆
On farm emissions	2	★☆☆
Off farm emissions	4	★★☆

Total Score: **55** Mean score for the three pillars: **3.5**

Barriers

1. Low investment capacity to start up silvopastoral systems
2. Insufficient promotion and adoption of the practice
3. Reduced germoplasm bank for improvement of perennial trees
4. Very long time to establish perennial trees

CSA Pillars



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Prioritized List

Select some practices to create CSA portfolios

Practices	Indicators Score					CBA-ROI	Data Quality	
	Total	Mean	Production	Adaptation	Mitigation			
☑ Silvopastoral Systems	55	3.5	3.0	4.0	3.6	**1.5**	2.1	Barreras
☑ Biogas	45	2.8	2.0	3.0	3.4	**1.0**	2.8	Barreras
☑ Water Harvest Structure	45	2.8	1.0	4.0	3.4	**0.9**	2.3	Barreras
☑ Efficient Use of Fertilizer	30	2.0	3.5	2.5	0.2	**1.2**	2.1	Barreras
☐ Grass-Legume Association	29	1.8	2.0	2.0	1.4	**0.8**	2.0	Barreras
☐ Improved Forages	25	1.6	2.5	2.0	0.3	**1.5**	2.5	Barreras
☐ Diseases Management	24	1.5	1.0	3.0	0.5	**1.0**	2.5	Barreras
☐ Silage, Haylage and Nutritional Blocks	20	1.2	1.2	2.0	0.4	**0.9**	1.9	Barreras
☐ Early Warning Systems	19	1.2	1.0	2.5	0.1	**0.5**	2.5	Barreras
☐ Harvest Residues in Livestock Diet	9	0.6	1.0	0.5	0.3	**0.4**	1.0	Barreras

Portfolio 1

Silvopastoral Systems
Efficient Use of Fertilizer
Improved Forages
Biogas

Portfolio 2

Silvopastoral Systems
Efficient Use of Fertilizer
Improved Forages
Grass-Legume Association

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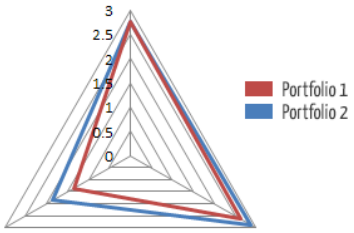
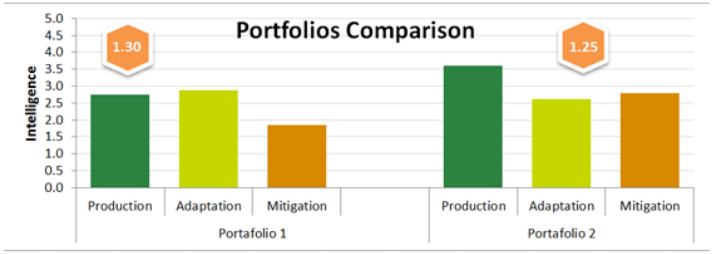
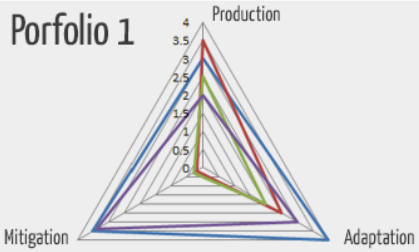
Portfolios





Porfolio 1



Synergies

Low — High

Barriers

- Silvopastoral Systems
- Efficient Use of Fertilizer
- Improved Forages
- Biogas

	Average
Production	2.75
Adapatation	2.87
Mitigation	2.85

Porfolio 2

Synergies

Low — High

Barriers

- Silvopastoral Systems
- Efficient Use of Fertilizer
- Improved Forages
- Grass-Legume Association

	Average
Production	2.75
Adaptation	2.65
Mitigation	1.35

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Characteristics of framework

- **Flexible** — The process can be modified base don the level of detail desired, available information, capacity, time, and resources, and can still gibe useful for decision making.
- **Simple** — Estimated time, 4-8 months
- **Stakeholder Driven** — Inclusive and participatory process
- **Linkable** — With other analytical tools and existing planning mechanisms
- **Adaptive Management** — Can also use for monitoring and evaluating

LAM partnerships in action

- Pilot in development in Guatemala with the Climate Change Unit of the Ministry of Agriculture, Livestock, and Food Security
- Actions underway to include climate change in governmental agricultural policies
- Urgent need to guide farmers in the face of ongoing extreme climate events (e.g. 2014 drought)

Thanks!

Caitlin Corner-Dolloff
CIAT
c.corner-dolloff@cgiar.org

Andreea Nowak
CIAT
a.c.nowak@cgiar.org

Miguel Lizarazo
LAM contact, CCAFS-CIAT
m.lizarazo@cgiar.org

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